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**UTAH OGM REPORT REVIEW**

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March 10, 2008

**TO:** Daron Haddock, Permit Supervisor

**FROM:**  Dana Dean

**SUBJECT:** Summary of the 2007 Investigation and Proposed Mitigation Activities. North Water Spring and Joe's Mill Pond Areas (November 2007)

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Canyon Fuel Company's SUFCO Mine conducted longwall mining beneath North Water Canyon and the Joe's Mill Pond areas during the winter of 2005-2006. This longwall mining caused the North Water Spring (Pines 105), and a seep near Joe's Mill Pond to lose surface flow. The water has descended into the alluvium, which lies directly on top of the Castle Gate Sandstone. The Castle Gate Sandstone is the source for the Pines Tract springs and is highly responsive to surface recharge. Discharges from the drainage have remained fairly constant, suggesting that the water is not lost from the aquifer system, but is simply not reaching the springs due to lowering.

In January of 2007, Canyon Fuel Company proposed the following investigation and mitigation activities for the summer of 2007:

- Drill and install additional piezometers in the North Water Canyon and Joe's Mill Pond areas.
- Conduct a VLF survey to locate subsidence cracks, if possible.
- Pilot test the effectiveness of an intra-alluvial grout curtain.

The November report provides the following information regarding the activities carried out in 2007:

*Piezometer Installation*

During 2007, Canyon Fuel Company installed piezometers in the tributaries to North Water Canyon, in the main canyon upstream of Pines 310, upstream of Joe's Mill Pond, and downstream of Pines 105. Of the three tributaries to North Water Canyon, groundwater was found in the ones associated with Pines 105, and Pines 310. Groundwater was also encountered in the drainage upstream of Joe's Mill Pond. No appreciable groundwater was found in the Pines 311 tributaries.

*VLF Survey*

The success of the VLF survey would depend on a noticeable difference in the size and nature of subsidence fractures vs. natural fractures, or a difference in the chemistry of the fluid in the fractures.

No noticeably large subsidence caused fractures were detected, and the chemistry of the water did not vary enough to locate any fractures. VLF methods will not be useful in locating subsurface subsidence fractures in this groundwater system.

#### *Intra-Alluvial Grout Curtain*

After a failed first attempt (three holes completed, fourth hole in fracture too big to grout through a small hole), a bentonite-cement slurry "dam" was built across the alluvium just down-channel from Pines 105. The level of the groundwater was raised somewhat by the grout curtain, but because it was installed in August it remains unclear as to whether it will raise the water level enough to surface during wetter periods. Canyon Fuel will continue to monitor this spring.

#### *Continued Mitigation Efforts*

Since the 2007 piezometer study showed that there is appreciable groundwater in the tributaries to North Water Canyon, Canyon Fuel Company is proposing to capture that water in the tributary and pipe it to the spring location, where it will discharge to the surface. They plan to install a water collection system at Pines 105 this summer, and if it works implement the same idea at the other affected springs.

The Division finds that Canyon Fuel is making a concerted effort to mitigate the damage to the Pines Tract springs. They have been supplying water at the Pines 105 area to allow cattle grazing practices to continue as before. They have continued to investigate the groundwater system in the area, and are seeking the best possible mitigation techniques. They have kept the Division and all interested parties apprised of the situation and each step they have taken.

The Division agrees with Canyon Fuel Company's proposed mitigation plan at the Pines 105 spring. Canyon Fuel will need to amend their MRP and bond for the area to be disturbed while creating the water collection and conveyance system.

Based on the Definition of "Hydrologic Balance" (R645-100-200), the loss of water at the Pines Tract springs **does not constitute material or other damage to the hydrologic balance**, since the quantity and quality of water flowing into and out of the basin, and the storage within the basin has not measurably changed due to mining. Based on the Division of Water Right's position that the North Water Spring is a state appropriated water right (diligence claim) the Division **does** consider this a water-replacement issue, until and unless Canyon Fuel Company can successfully dispute the existence of a water right at the North Water Spring (Pines 105). The question of whether this constitutes subsidence caused material damage (definition of "Material Damage") will depend on the final state of the land and its ability to support designated land uses.

**"Hydrologic Balance"** means the relationship between the quality and quantity of water inflow to, water outflow from, and water storage in a hydrologic unit such as a drainage basin, aquifer, soil zone, lake, or reservoir. It encompasses the dynamic relationships among precipitation, runoff, evaporation, and changes in ground and surface water storage.

**"Material Damage"** for the purposes of R645-301525, means:

- (a) Any functional impairment of surface lands, features, structures or facilities;
- (b) Any physical change that has a significant adverse impact on the affected land's capability to support any current or reasonably foreseeable uses or causes significant loss in production or income; or

- (c) Any significant change in the condition, appearance or utility of any structure or facility from its pre-subsidence condition.

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